

BUREAU INTERNATIONAL DES POIDS ET MESURES  
ORGANISATION INTERGOUVERNEMENTALE DE LA CONVENTION DU METRE  
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1 - Coordinated Universal Time UTC and its local realizations UTC(k). Computed values of  $[UTC-UTC(k)]$  and uncertainties valid for the period of this Circular. From 2012 July 1, 0h UTC,  $TAI-UTC = 35$  s.

Date 2014	0h UTC	OCT 29	NOV 3	NOV 8	NOV 13	NOV 18	NOV 23	NOV 28	Uncertainty/ns		
MJD		56959	56964	56969	56974	56979	56984	56989	$u_A$	$u_B$	$u$
Laboratory <i>k</i>		$[UTC-UTC(k)]/ns$									
AOS (Borowiec)		-1.8	-1.8	-2.5	-3.8	-5.3	-6.1	-5.7	0.4	5.1	5.1
APL (Laurel)		0.2	0.3	-0.4	-1.1	-1.6	-3.0	-4.0	0.3	4.9	4.9
AUS (Sydney)		-260.6	-277.0	-289.7	-303.9	-317.7	-318.2	-321.9	0.4	5.0	5.1
BEV (Wien)		6.4	7.0	13.1	18.5	27.1	24.6	37.7	0.4	3.1	3.1
BIM (Sofiya)		1758.2	1768.5	1775.7	1785.3	1783.2	1810.5	1834.8	1.5	7.0	7.2
BIRM (Beijing)		24.3	27.4	29.7	29.8	33.6	37.2	37.8	1.5	20.0	20.1
BY (Minsk)		21.3	25.3	25.6	22.4	18.2	12.8	2.6	1.5	7.0	7.2
CAO (Cagliari)		-758.2	-878.2	-1004.4	-1117.5	-1238.9	-1358.1	-1478.7	8.0	7.0	10.7
CH (Bern-Wabern)		-4.3	-6.4	-5.5	-5.8	-5.7	-5.0	-4.4	0.4	1.2	1.3
CNM (Queretaro)		0.3	3.4	4.0	8.8	1.2	1.5	20.8	2.0	5.1	5.4
CNMP (Panama)		-17.1	1.0	12.2	22.2	-13.7	-21.3	-23.7	3.5	5.1	6.2
DLR (Oberpfaffenhofen)		-	-	-	-	-	-	-	-	-	-
DMDM (Belgrade)		1.6	1.4	-0.3	-8.1	-5.9	-7.9	-8.2	0.4	7.0	7.0
DTAG (Frankfurt/M)		39.7	40.7	45.5	52.5	52.5	58.5	62.8	0.4	10.0	10.0
EIM (Thessaloniki)		-1.7	5.9	3.5	10.0	7.5	16.5	4.1	7.5	5.1	9.0
ESTC (Noordwijk)		-1.3	-0.6	-0.7	-1.4	-0.7	-1.7	-0.2	0.4	5.1	5.1
HKO (Hong Kong)		1127.3	1137.8	1152.5	1173.2	1191.4	1208.9	1215.1	0.4	5.0	5.0
IFAG (Wetzell)		-1153.9	-1148.7	-1133.4	-1130.3	-1120.3	-1108.5	-1096.3	0.4	5.0	5.0
IGNA (Buenos Aires)		4256.0	4342.8	4433.7	4515.5	4598.9	4685.6	4777.4	2.0	5.1	5.4
INPL (Jerusalem)		2.2	11.6	21.2	26.9	27.2	33.2	34.9	0.4	7.0	7.0
INTI (Buenos Aires)		1.2	-2.9	-1.4	10.2	4.0	10.5	22.7	2.5	20.0	20.2
INXE (Rio de Janeiro)		-21.7	-24.9	-20.6	-21.4	-21.9	-19.0	-16.0	0.4	20.0	20.0
IPQ (Caparica)		-0.7	0.0	-4.2	-1.8	-2.8	-1.6	0.0	0.4	7.0	7.0
IT (Torino)		-1.3	-0.6	0.5	0.5	0.1	-0.3	-0.4	0.3	1.4	1.4
JATC (Lintong)		0.8	2.5	2.2	3.4	0.8	1.3	0.6	1.0	4.9	5.0
JV (Kjeller)		64.5	66.0	72.6	72.7	74.0	64.1	69.8	5.0	20.0	20.6
KEBS (Nairobi)		-3435.2	-3716.8	-3998.7	-4287.1	-4577.7	-4850.2	-5133.9	1.5	20.0	20.1
KIM (Serpong-Tangerang)		-	206.1	231.2	234.1	232.8	228.7	220.9	2.0	20.0	20.1
KRIS (Daejeon)		16.0	9.5	3.3	-1.4	-3.6	-2.2	-1.2	0.4	5.1	5.1
KZ (Astana)		-	-	-	-1306.5	-1287.2	-1269.8	-1264.8	1.5	20.0	20.1

Date 2014	0h UTC	OCT 29	NOV 3	NOV 8	NOV 13	NOV 18	NOV 23	NOV 28	Uncertainty/ns			
MJD		56959	56964	56969	56974	56979	56984	56989	$u_A$	$u_B$	$u$	
Laboratory $k$		[UTC-UTC( $k$ )]/ns										
LT (Vilnius)		674.1	671.6	697.4	727.6	735.1	718.9	752.5	2.0	5.0	5.4	
MASM (Bayanzurkh)		-555.2	-585.1	-617.7	-646.8	-671.2	-705.2	-733.4	1.5	20.0	20.1	
MIKE (Espoo)		3.9	4.3	4.8	4.6	4.1	3.8	3.5	0.4	7.0	7.0	
MKEH (Budapest)		-22627.0	-22833.5	-23033.8	-23248.5	-23442.8	-23656.5	-23868.9	1.5	20.0	20.1	
MSL (Lower Hutt)		145.7	183.8	203.3	233.6	237.2	256.5	283.8	1.5	20.0	20.1	
MTC (Makkah)		-	-	15.7	-7.8	-45.6	-78.9	-7.1	1.5	7.0	7.2	
NAO (Mizusawa)		-64.2	-91.6	-112.2	-110.2	-110.8	-116.5	-118.1	2.0	20.0	20.1	
NICT (Tokyo)		18.5	18.7	18.5	17.7	18.4	19.8	19.3	0.3	4.6	4.6	
NIM (Beijing)		-9.6	-8.6	-8.0	-7.8	-7.0	-6.2	-5.0	0.3	4.9	4.9	
NIMB (Bucharest)		407.9	408.0	417.8	422.3	428.4	446.0	462.1	4.5	20.0	20.5	
NIMT (Pathumthani)		32.1	36.0	31.1	32.9	31.0	12.2	-1.0	1.0	20.0	20.0	
NIS (Cairo)		-8136.3	-8124.6	-8118.7	-8109.0	-8107.1	-8099.8	-8100.4	0.8	7.0	7.1	
NIST (Boulder)		10.9	11.5	12.2	11.9	11.6	11.4	11.1	0.3	4.8	4.8	
NMIJ (Tsukuba)		-15.6	-18.9	-20.5	-21.6	-20.8	-18.8	-17.0	0.4	5.0	5.1	
NMLS (Sepang)		-197.7	-186.1	-188.6	-190.8	-170.9	-166.9	-157.0	1.0	20.0	20.0	
NPL (Teddington)		-5.6	-4.8	-4.4	-3.8	-2.9	-0.9	1.3	0.4	7.0	7.0	
NPLI (New-Delhi)		1.7	0.5	0.5	0.4	1.3	3.1	4.7	0.4	7.0	7.0	
NRC (Ottawa)		-81.4	-88.8	-88.1	-91.6	-79.0	-80.8	-74.9	0.4	5.0	5.1	
NRL (Washington DC)		-162.4	-113.1	-62.3	-12.2	34.9	58.9	55.1	0.4	5.1	5.1	
NTSC (Lintong)		0.6	-0.8	-0.4	1.7	-1.5	-2.2	-2.3	1.0	4.8	4.9	
ONBA (Buenos Aires)		-	-2078.5	-2082.6	-2097.5	-2105.3	-2135.3	-2140.5	2.5	5.1	5.6	
ONRJ (Rio de Janeiro)		-0.2	-0.2	1.7	0.9	-0.6	-3.2	-1.1	1.3	7.0	7.1	
OP (Paris)		-2.3	-2.9	-3.2	-3.4	-3.2	-2.9	-2.8	0.3	1.3	1.3	
ORB (Bruxelles)		-3.2	-0.2	4.3	10.4	9.8	5.8	4.2	0.4	5.0	5.0	
PL (Warszawa)		-4.6	-14.5	-16.5	-17.9	-14.4	-10.5	-11.4	0.4	5.0	5.0	
PTB (Braunschweig)		-2.1	-1.6	-1.5	-1.5	-1.8	-2.0	-2.5	0.2	0.7	0.8	
ROA (San Fernando)		-7.1	-6.9	-6.1	-7.3	-7.9	-5.1	-2.8	0.4	5.0	5.0	
SASO (Riyadh)		387.6	398.6	414.6	421.0	435.5	444.5	457.7	0.7	7.0	7.1	
SCL (Hong Kong)		-162.3	-165.6	-152.3	-140.9	-145.2	-147.4	-135.9	4.0	10.0	10.8	
SG (Singapore)		25.9	24.0	26.5	21.0	11.5	4.4	1.4	0.4	5.0	5.1	
SIQ (Ljubljana)		-1967.3	-1981.2	-1978.0	-1994.5	-1973.5	-1995.7	-2004.6	4.0	20.0	20.4	
SMD (Bruxelles)		-4.4	-1.9	-5.1	-3.8	0.3	5.8	8.1	0.4	7.0	7.0	
SMU (Bratislava)		-57.4	-70.3	-74.1	-75.4	-74.7	-75.8	-77.8	1.0	20.0	20.0	
SP (Boras)		9.6	6.6	4.7	2.0	-1.3	-0.4	-0.2	0.3	1.2	1.2	
SU (Moskva)		2.3	2.3	2.5	2.1	1.2	1.6	2.1	0.5	1.3	1.4	
TL (Chung-Li)		-1.6	-0.8	-1.5	-2.1	-2.1	-1.7	-2.1	0.4	4.9	5.0	
TP (Praha)		-14.1	-26.5	-23.3	-12.7	-13.0	-15.8	-9.8	0.4	5.0	5.0	
UA (Kharkov)		7.5	-5.4	-11.6	-15.4	-16.1	-14.8	-19.4	1.5	7.0	7.2	
UME (Gebze-Kocaeli)		-242.3	-243.3	-260.9	-269.3	-278.3	-284.4	-284.7	1.0	7.0	7.1	
USNO (Washington DC)		-2.0	-1.1	-1.1	-1.3	-1.2	-1.6	-1.1	0.3	0.9	1.0	
VMI (Ha Noi)		-29.5	-19.4	-18.9	-18.6	-16.3	-3.4	3.2	0.4	20.0	20.0	
VSL (Delft)		-18.9	-22.8	-20.1	-18.6	-8.4	-5.1	-4.4	0.4	1.2	1.3	
ZA (Pretoria)		5171.2	5125.1	5088.0	5061.9	5017.8	4983.0	4964.1	1.5	19.9	19.9	

2 - International Atomic Time TAI and Local atomic time scales TA(k). Computed values of  $[TAI-TA(k)]$ .

Date 2014	0h UTC	OCT 29	NOV 3	NOV 8	NOV 13	NOV 18	NOV 23	NOV 28
MJD		56959	56964	56969	56974	56979	56984	56989
Laboratory k		$[TAI-TA(k)]/ns$						
CH (Bern-Wabern)		23601.6	23525.0	23447.8	23371.4	23294.4	23220.0	23143.2
CNM (Queretaro)		-790.9	-778.4	-774.9	-768.8	-769.6	-739.3	-724.2
F (Paris)		167629.0	167627.0	167625.2	167624.8	167625.3	167624.6	167625.1
JATC (Lintong)		-56602.5	-56632.6	-56661.0	-56688.1	-56716.1	-56744.5	-56773.3
KRIS (Daejeon)		45663.9	45666.9	45669.7	45675.7	45685.9	45699.8	45713.3
NICT (Tokyo)		1255.6	1257.9	1261.7	1264.5	1269.7	1272.7	1275.9
NIST (Boulder)		-45410435.0	-45410621.3	-45410807.5	-45410994.3	-45411180.6	-45411366.8	-45411553.1
NRC (Ottawa)		21933.0	21908.8	21893.1	21873.0	21868.7	21850.2	21839.3
NTSC (Lintong)		19644.5	19677.6	19709.7	19742.4	19776.7	19810.4	19842.3
ONRJ (Rio de Janeiro)		-20587.7	-20637.2	-20685.0	-20733.8	-20782.2	-20831.2	-20878.3
PL (Warszawa)		-6710.2	-6710.6	-6719.9	-6722.9	-6731.2	-6735.7	-6737.6
PTB (Braunschweig)		2010.9	2013.1	2012.8	2012.3	2011.8	2011.1	2010.4
SG (Singapore)		17395.9	17444.0	17506.5	17561.0	17611.5	17664.4	17711.4
SU (Moskva)		27291064.5	27291064.5	27291064.7	27291064.3	27291063.4	27291063.8	27291064.3 (1)
TL (Chung-Li)		-145.5	-145.9	-147.8	-150.7	-150.3	-153.0	-155.5
USNO (Washington DC)		-35159351.1	-35159639.9	-35159927.5	-35160216.4	-35160504.0	-35160792.7	-35161080.3

- Note on section 2:

(1) SU : Listed values are  $TAI-TA(SU) - 2.80$  seconds.

3 - Difference between the normalized frequencies of EAL (free atomic time scale) and TAI.

	Interval of validity	$f(EAL)-f(TAI)$	
Steering correction	56959 - 56989	$6.483 \times 10^{-13}$	(2014 OCT 29 - 2014 NOV 29)
New correction	56989 - 57019	$6.483 \times 10^{-13}$	(2014 NOV 28 - 2014 DEC 28)
New correction foreseen	57019 - 57049	$6.483 \times 10^{-13}$	(2014 DEC 28 - 2015 JAN 27)

4 - Duration of the TAI scale interval.

TAI is a realization of coordinate time TT. The following tables give the fractional deviation  $d$  of the scale interval of TAI from that of TT (the SI second on the geoid), i.e. the fractional frequency deviation of TAI with the opposite sign:  $d = -y_{TAI}$ . In this section, a frequency over a time interval is defined as the ratio of the end-point phase difference to the duration of the interval. Whenever needed, the instability of EAL should be expressed as the quadratic sum of three components with  $\tau$  in days: (1) a white frequency noise of  $2.0 \times 10^{-15} / \sqrt{\tau}$ , (2) a flicker frequency noise of  $0.4 \times 10^{-15}$  and (3) a random walk frequency noise of  $0.3 \times 10^{-16} \times \sqrt{\tau}$ . The relation between EAL and TAI is given in *Circular T* and the *BIPM Annual Report on Time Activities*.

In the first table,  $d$  is obtained, on the given periods of estimation by comparison of the TAI frequency with that of the given individual Primary and Secondary Frequency Standards (PFS/SFS). In this table:  $u_A$  is the uncertainty originating in the instability of the standard,  $u_B$  is the combined uncertainty from systematic effects,  $u_{1/Lab}$  is the uncertainty in the link between the standard and the clock participating to TAI, including the uncertainty due to the dead-time,  $u_{1/TAI}$  is the uncertainty in the link to TAI,  $u$  is the quadratic sum of all four uncertainty values. Ref( $u_B$ ) is a reference giving information on the values of  $u_B$  or is the *Circular T* where the reference was first given.  $u_B(Ref)$  is the  $u_B$  value stated in this reference. Note that all uncertainties may vary over time and that the current  $u_B$  values are generally not the same as the peer reviewed values given in Ref( $u_B$ ). See "<http://www.bipm.org/jsp/en/TimeFtp.jsp>" for previous issues of *Circular T* and individual Reports of Evaluation of Primary and Secondary Frequency Standards that explain changes in uncertainties. For the SFS,  $u_{Srep}$  represents the recommended uncertainty of the secondary representation of the second and Ref( $u_S$ ) provides the reference for the frequency of the transition and its uncertainty  $u_{Srep}$ , these two fields are not applicable to PFS. All values are expressed in  $10^{-15}$  and are valid only for the stated period of estimation.

Standard	Period of Estimation	$d$	$u_A$	$u_B$	$u_{1/Lab}$	$u_{1/TAI}$	$u$	$u_{Srep}$	Ref( $u_S$ )	Ref( $u_B$ )	$u_B(Ref)$	Note
PTB-CS1	56959 56989	-12.28	6.00	8.00	0.00	0.10	10.00	PFS/NA		T148	8.	(1)
PTB-CS2	56959 56989	-5.07	3.00	12.00	0.00	0.10	12.37	PFS/NA		T148	12.	(1)
IT-CsF2	56954 56964	0.78	1.30	0.17	0.32	0.62	1.49	PFS/NA		T315	0.19	(2)
IT-CsF2	56964 56979	-0.24	1.00	0.17	0.22	0.49	1.15	PFS/NA		T315	0.19	(3)
NPLI-CsF1	56419 56439	-0.27	0.53	2.60	0.13	0.28	2.67	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56514 56529	3.54	0.47	3.01	0.15	0.37	3.07	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56589 56599	0.97	0.90	2.65	0.20	0.53	2.85	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56604 56614	1.35	0.61	2.71	0.19	0.53	2.83	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56644 56654	-0.85	0.74	2.74	0.18	0.53	2.89	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56659 56669	1.02	0.75	2.36	0.18	0.53	2.54	PFS/NA		[1]	2.5	(4)
NPLI-CsF1	56679 56689	-0.27	0.93	2.36	0.19	0.53	2.60	PFS/NA		[1]	2.5	(4)
SYRTE-F02	56959 56989	1.04	0.20	0.27	0.10	0.23	0.42	PFS/NA		T301	0.23	(5)
SYRTE-FORb	56959 56974	1.17	0.20	0.29	0.11	0.43	0.57	1.3	[2]	T301	0.35	(5)
SYRTE-FORb	56979 56989	0.97	0.30	0.29	0.11	0.70	0.82	1.3	[2]	T301	0.35	(5)
SU-CsF02	56959 56989	0.53	0.23	0.25	0.11	0.33	0.48	PFS/NA		T315	0.50	(6)

Notes:

- (1) Continuously operating as a clock participating to TAI
- (2) Report 05 NOV. 2014 by INRIM
- (3) Report 02 DEC. 2014 by INRIM
- (4) Report 26 NOV. 2014 by NPLI
- (5) Report 03 DEC. 2014 by LNE-SYRTE
- (6) Report 01 DEC. 2014 by SU

[1] Uncertainty evaluation of the Cesium fountain frequency standard NPLI-CsF1. P.Arora, A.Acharya and A. Sen Gupta, submitted to *Metrologia*.

[2] CIPM Recommendation 1 (CI-2013) : Updates to the list of standard frequencies in *Procès-Verbaux des Séances du Comité International des Poids et Mesures*, 102nd meeting (2013), 2014, 188 p.

The second table gives the BIPM estimate of  $d$ , based on all available PFS and SFS measurements over the period MJD 56599-56989, taking into account their individual uncertainties and characterizing the instability of EAL as noted above.  $u$  is the computed standard uncertainty of  $d$

Period of estimation	$d$	$u$	
56959-56989	$0.70 \times 10^{-15}$	$0.27 \times 10^{-15}$	(2014 OCT 29 - 2014 NOV 28)

5 - Relations of UTC and TAI with predictions of UTC(k) disseminated by GNSS and their System Times.

$$\begin{aligned}
 [UTC-GPS \text{ time}] &= -16 \text{ s} + C_0, & [TAI-GPS \text{ time}] &= 19 \text{ s} + C_0, & \text{global uncertainty is of the order of 10 ns.} \\
 [UTC-UTC(USNO)_{GPS}] &= C_0', & [TAI-UTC(USNO)_{GPS}] &= 35 \text{ s} + C_0', & \text{global uncertainty is of the order of 10 ns.} \\
 [UTC-GLONASS \text{ time}] &= C_1, & [TAI-GLONASS \text{ time}] &= 35 \text{ s} + C_1, & \text{global uncertainty is of the order of hundreds ns.} \\
 [UTC-UTC(SU)_{GLONASS}] &= C_1', & [TAI-UTC(SU)_{GLONASS}] &= 35 \text{ s} + C_1', & \text{global uncertainty is of the order of hundreds ns.}
 \end{aligned}$$

$[UTC(USNO)_{GPS}]$  and  $[UTC(SU)_{GLONASS}]$  are, respectively, UTC(USNO) and UTC(SU) as predicted by USNO and SU and disseminated by GPS and GLONASS. The  $C_0$  and  $C_0'$  values provide realizations of GPS time and of the prediction of UTC(USNO) broadcast by GPS, as obtained using the values  $[UTC-UTC(OP)]$  and the GPS data taken at the Paris Observatory, corrected for IGS precise orbits, clocks and ionosphere maps. The  $C_1$  and  $C_1'$  values provide realizations of GLONASS time and of the prediction of UTC(SU) broadcast by GLONASS, as obtained using the values  $[UTC-UTC(AOS)]$  and the GLONASS data taken at the Astrogeodynamical Observatory Borowiec (AOS).  $N_0, N_0', N_1$  and  $N_1'$  are the numbers of measurements; when  $N_0, N_0', N_1$  or  $N_1'$  is 0, the corresponding values in the table are interpolated. The standard deviations  $\sigma_0, \sigma_0', \sigma_1$  and  $\sigma_1'$  characterize the dispersion of individual measurements. The actual uncertainty of users' access to GPS and GLONASS times may differ from these values. For this edition of circular,  $\sigma_0 = 1.0 \text{ ns}$ ,  $\sigma_0' = 1.1 \text{ ns}$ ,  $\sigma_1 = 7.1 \text{ ns}$ ,  $\sigma_1' = 7.1 \text{ ns}$

2014	0h UTC	MJD	$C_0/\text{ns}$	$N_0$	$C_0'/\text{ns}$	$N_0'$	$C_1/\text{ns}$	$N_1$	$C_1'/\text{ns}$	$N_1'$
	OCT 29	56959	-2.7	86	-2.4	86	26.6	68	190.3	68
	OCT 30	56960	-2.5	90	-2.8	90	31.0	84	192.2	83
	OCT 31	56961	-2.7	89	-2.5	89	35.2	83	193.6	82
	NOV 1	56962	-3.1	89	-1.8	89	41.3	89	197.5	89
	NOV 2	56963	-2.2	89	-1.1	89	45.9	84	200.7	86
	NOV 3	56964	-3.6	90	-3.8	90	46.2	89	199.9	88
	NOV 4	56965	-2.8	88	-2.6	88	48.7	89	201.3	89
	NOV 5	56966	-2.7	89	-2.5	89	53.1	89	204.9	89
	NOV 6	56967	-2.0	89	-2.8	89	53.5	80	204.9	80
	NOV 7	56968	-1.3	90	-2.4	90	54.7	87	204.7	87
	NOV 8	56969	-1.0	89	-2.4	89	55.5	78	203.8	80
	NOV 9	56970	-1.3	89	-1.8	89	57.9	89	204.6	89
	NOV 10	56971	-2.6	89	-2.5	89	64.0	88	209.4	88
	NOV 11	56972	-3.0	90	-2.2	90	67.1	90	211.8	90
	NOV 12	56973	-2.3	89	-1.5	89	68.0	87	211.9	87
	NOV 13	56974	-1.7	89	-1.3	89	71.2	86	214.2	84

2014	0h UTC	MJD	$C_0$ /ns	$N_0$	$C_0'$ /ns	$N_0'$	$C_1$ /ns	$N_1$	$C_1'$ /ns	$N_1'$
	NOV 14	56975	-1.0	89	-1.0	89	74.7	87	216.7	88
	NOV 15	56976	-1.3	90	-2.2	90	78.8	86	219.5	86
	NOV 16	56977	-3.0	89	-2.5	89	81.1	83	220.5	83
	NOV 17	56978	-3.6	89	-2.1	89	82.1	82	220.1	82
	NOV 18	56979	-4.5	89	-3.9	89	84.6	79	220.1	79
	NOV 19	56980	-4.8	90	-3.5	90	88.9	70	221.2	70
	NOV 20	56981	-3.2	88	-1.8	88	93.3	83	222.8	83
	NOV 21	56982	-2.1	89	-1.8	89	97.9	76	224.1	76
	NOV 22	56983	-0.6	89	-1.4	89	102.7	76	224.5	74
	NOV 23	56984	-0.3	90	-1.3	90	105.5	79	223.1	79
	NOV 24	56985	-0.9	89	-4.4	88	106.8	82	220.3	81
	NOV 25	56986	-2.0	89	-3.5	89	110.7	71	219.4	70
	NOV 26	56987	-2.1	89	-2.3	89	115.5	82	219.0	80
	NOV 27	56988	-1.8	90	-1.6	90	118.6	84	216.9	83
	NOV 28	56989	-1.2	89	-2.2	89	121.4	80	214.8	80

## 6 - Time links used for the computation of TAI and their uncertainties.

The time links used in the elaboration of this *Circular T* are listed in this section. The technique for the link is indicated as follows:

GPS SC for GPS all-in-view single-channel C/A data; GPS MC for GPS all-in-view multi-channel C/A data; GPS P3 for GPS all-in-view multi-channel dual-frequency P code data; GPS PPP for GPS Precise Point Positioning technique; GPS GT for 'GPS time' observations; GLN MC for GLONASS common-view multi-channel C/A data; GPSGLN for the combination of GPS MC and GLN MC links; TWGPPP/TWGPP3 for the combined smoothing of TWSTFT and GPS PPP/GPS P3; INT LK for internal cable link and TWSTFT for two-way satellite time and frequency transfer data.

For each link, the following uncertainties are provided:  $u_A$  is the standard uncertainty accounting for measurement noise and random effects with typical duration between 1 day and 30 days.  $u_B$  is the estimated uncertainty of the calibration.

The calibration type of the link is indicated as: GPS EC for GPS equipment calibration; TW EC for two-way equipment calibration; LC (technique) for a link calibrated using 'technique'; BC (technique) for a link calibrated using 'technique' to transfer a past equipment calibration through a discontinuity of link operation. DIC is used for direct internal calibration.

The calibration dates indicate: the most recent calibration results for the two laboratories in the case of EC and the most recent calibration of the link in the case of LC and BC.  
NA stands for not available, in this case estimated values are provided.

Link	Type	$u_A$ /ns	$u_B$ /ns	Calibration Type	Calibration Dates
APL /PTB	GPSPPP	0.3	5.0	LC(GPS MC)	2012 Sep
AUS /PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2010 Oct/2004 Aug
BEV /PTB	GPSPPP	0.3	3.0	BC(GPS MC)	2012 Mar
BIM /PTB	GPS MC	1.5	7.0	GPS EC/GPS EC	2007 Nov/2006 Sep
BIRM/PTB	GPS MC	1.5	20.0	NA /GPS EC	NA /2006 Sep
BY /PTB	GPS MC	1.5	7.0	GPS EC/GPS EC	2008 Jun/2006 Sep
CAO /PTB	GPS MC	8.0	7.0	GPS EC/GPS EC	2004 Nov/2006 Sep
CH /PTB	TWGPPP	0.3	1.0	LC(TWSTFT)/BC(GPS PPP)	2008 Sep/2009 Aug
CNM /PTB	GPS MC	2.0	5.0	BC(GPS SC)	2008 May
CNMP/PTB	GPS MC	3.5	5.0	GPS EC/GPS EC	2004 May/2006 Sep
DLR /PTB	NA				
DMDM/PTB	GPSPPP	0.3	7.0	LC(GPS MC)	2012 Jul
DTAG/PTB	GPSPPP	0.3	10.0	LC(GPS MC)	2009 Jul
EIM /PTB	GPS MC	7.5	5.0	GPS EC/GPS EC	2007 May/2003 Aug
ESTC/PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2012 Nov/2004 Aug
HKO /PTB	GPSPPP	0.3	5.0	LC(GPS MC)	2013 Apr
IFAG/PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2003 Jun/2004 Aug
IGNA/PTB	GPS MC	2.0	5.0	GPS EC/GPS EC	2004 Aug/2006 Sep
INPL/PTB	GPSPPP	0.3	7.0	GPS EC/GPS EC	2009 Jun/2004 Aug
INTI/PTB	GPS MC	2.5	20.0	NA /GPS EC	NA /2006 Sep
INXE/PTB	GPSPPP	0.3	20.0	NA /GPS EC	NA /2006 Sep
IPQ /PTB	GPSPPP	0.4	7.0	LC(GPS MC)	2010 Aug
IT /PTB	TWGPPP	0.3	1.2	LC(TWSTFT)/BC(GPS PPP)	2008 Sep/2009 Aug
JATC/NTSC	INT LK	0.2	1.0	DIC	/2006 Sep
JV /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Aug
KEBS/PTB	GPS MC	1.5	20.0	NA /GPS EC	NA /2006 Sep
KIM /PTB	GPS MC	2.0	20.0	NA /GPS EC	NA /2006 Sep
KRIS/PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2005 Aug/2004 Aug
KZ /PTB	GPSGLN	1.5	20.0	NA /GPS EC	NA /2006 Sep
LT /PTB	GPS MC	2.0	5.0	GPS EC/GPS EC	2006 Oct/2006 Sep
MASM/PTB	GPS P3	1.5	20.0	NA /GPS EC	NA /2004 Aug
MIKE/PTB	GPSPPP	0.3	7.0	NA /GPS EC	NA /2004 Aug
MKEH/PTB	GPS MC	1.5	20.0	NA /GPS EC	NA /2006 Sep
MSL /PTB	GPS P3	1.5	20.0	NA /GPS EC	NA /2004 Aug
MTC /PTB	GPS P3	1.5	7.0	GPS EC/GPS EC	2013 Aug/2004 Aug
NAO /PTB	GPS MC	2.0	20.0	NA /GPS EC	NA /2006 Sep
NICT/PTB	TWGPPP	0.3	5.0	LC(GPS P3)	2009 Jun
NIM /PTB	TWGPPP	0.3	5.0	LC(GPS P3)	2012 Oct
NIMB/PTB	GPS MC	4.5	20.0	NA /GPS EC	NA /2006 Sep

Link	Type	$u_A$ /ns	$u_B$ /ns	Calibration Type	Calibration Dates
NIMT/PTB	GPS P3	1.0	20.0	NA /GPS EC	NA /2004 Aug
NIS /PTB	GPS P3	0.8	7.0	LC(GPS MC)	2010 Jun
NIST/PTB	TWGPPP	0.3	5.0	LC(TWSTFT)/BC(GPS PPP)	2005 May/2009 Aug
NMIJ/PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2002 Apr/2004 Aug
NMLS/PTB	GPS P3	1.0	20.0	NA /GPS EC	NA /2006 Sep
NPL /PTB	GPSPPP	0.3	7.0	LC(GPS P3)	2008 Sep/2009 Nov
NPLI/PTB	TWGPPP	0.3	7.0	LC(GPS P3)	2012 Jun
NRC /PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2003 Nov/2004 Aug
NRL /PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2002 May/2004 Aug
NTSC/PTB	TWSTFT	1.0	5.0	BC(GPS MC)	2009 May
ONBA/PTB	GPS MC	2.5	5.0	GPS EC/GPS EC	2004 Jul/2006 Sep
ONRJ/PTB	GPS P3	1.3	7.0	GPS EC/GPS EC	2011 Dec/2006 Sep
OP /PTB	TWGPPP	0.3	1.1	LC(TWSTFT)/BC(GPS PPP)	2008 Sep/2009 Aug
ORB /PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2012 Oct/2004 Aug
PL /PTB	GPSPPP	0.3	5.0	LC(GPS MC)	2012 Mar
ROA /PTB	TWGPPP	0.3	5.0	LC(TWSTFT)/BC(GPS PPP)	2005 May/2009 Aug
SASO/PTB	GPS P3	0.7	7.0	GPS EC/GPS EC	2012 Nov/2006 Sep
SCL /PTB	GPS SC	4.0	10.0	GPS EC/GPS EC	1993 May/2006 Sep
SG /PTB	GPSPPP	0.4	5.0	GPS EC/GPS EC	2010 Mar/2004 Aug
SIQ /PTB	GPS SC	4.0	20.0	NA /GPS EC	NA /2003 Aug
SMD /PTB	GPSPPP	0.3	7.0	GPS EC/GPS EC	2011 Sep/2006 Sep
SMU /PTB	GPSGLN	1.0	20.0	NA /GPS EC	NA /2006 Sep
SP /PTB	TWGPPP	0.3	1.0	LC(TWSTFT)/BC(GPS PPP)	2006 Mar/2009 Aug
SU /PTB	TWSTFT	0.5	1.1	LC(TWSTFT)	2012 Nov
TL /PTB	TWGPPP	0.3	5.0	LC(GPS PPP)	2011 Dec
TP /PTB	GPSPPP	0.3	5.0	GPS EC/GPS EC	2009 Feb/2004 Aug
UA /PTB	GPS MC	1.5	7.0	GPS EC/GPS EC	2011 Mar/2006 Sep
UME /PTB	GPSGLN	1.0	7.0	GPS EC/GPS EC	2005 Dec/2006 Sep
USNO/PTB	TWSTFT	0.5	1.0	TW EC	2014 Jun
VMI /PTB	GPSPPP	0.3	20.0	NA /GPS EC	NA /2004 Aug
VSL /PTB	TWGPPP	0.3	1.0	LC(TWSTFT)/BC(GPS PPP)	2006 Mar/2009 Aug
ZA /PTB	GPS P3	1.5	20.0	NA /GPS EC	NA /2004 Aug